

What is claimed is:

1. An electrostatic actuator comprising:

first and second electrode portions arranged at predetermined intervals, each portion including one or more series of electrodes arranged successively in a predetermined direction;

a slider disposed between the first and second electrode portions having electrode portions at side faces opposed to the first and second electrode portions and movable in the predetermined direction;

an electrostatic capacitance detecting circuit configured to detect electrostatic capacitances between the one or more series of electrodes of one of the first and second electrode portions and the electrode portions of the slider; and

a driving circuit configured to drive the slider in the predetermined direction by applying voltages between selected series of electrodes of one of the first and the second electrode portions and the electrode portions of the slider, said selected series of electrodes being selected based on a detected result of the electrostatic capacitance detecting circuit.

2. The electrostatic actuator according to Claim 1, wherein the first and second electrode portions comprise:

driving electrodes configured to drive the slider, and

electrostatic capacitance detecting electrodes configured to detect the electrostatic capacitances.

3. The electrostatic actuator according to Claim 2, wherein a total sum of areas of the driving electrodes is larger than a total sum of areas of the electrostatic

capacitance detecting electrodes.

4. The electrostatic actuator according to Claim 2, wherein the driving electrodes are shifted by a half of an alignment pitch along the predetermined direction from the electrostatic capacitance detecting electrodes.

5. The electrostatic actuator according to Claim 1, wherein the electrode portions of the slider are provided along the predetermined direction and comprise:

driving electrode portions configured to drive the slider, and  
electrostatic capacitance detecting electrode portions configured to drive the electrostatic capacitances.

6. The electrostatic actuator according to Claim 5, wherein the driving electrode portions are shifted by a half of an alignment pitch along the predetermined direction from the electrostatic capacitance detecting electrode portions.

7. The electrostatic actuator according to Claim 6, wherein the number of the electrostatic capacitance detecting electrode portions is smaller than the number of the driving electrode portions.

8. The electrostatic actuator according to Claim 1, wherein the first and second electrode portions are provided with both a function of driving the slider and a function of detecting the electrostatic capacitances.

9. The electrostatic actuator according to Claim 1, wherein the first and second electrode portions are provided on a stator.

10. The electrostatic actuator according to Claim 1, wherein the slider comprises a lens producing an image of an object, the lens being disposed on the slider, orthogonal to the predetermined direction.

11. An electrostatic actuator comprising:

first and second electrode portions arranged at predetermined intervals, the first electrode portion including three or more series of electrodes arranged successively in a predetermined direction and said second electrode portion including a single series of electrodes extended in the predetermined direction;

a slider disposed between the first and second electrode portions and having electrode portions at a side face opposed to the first electrode portions, said slider movable in the predetermined direction;

an electrostatic capacitance detecting circuit configured to detect electrostatic capacitances between the three or more series of electrodes of the first electrode portion and the electrode portions of the slider; and

a driving circuit configured to drive the slider in the predetermined direction by applying voltages between selected series of electrodes of one of the first and second electrode portions and the electrode portions of the slider, said selected series of electrodes being selected based on a detected result of the electrostatic capacitance detecting circuit.

12. The electrostatic actuator according to Claim 11, wherein the first electrode portion is provided with both a function of driving the slider and a function of detecting the electrostatic capacitances.

13. The electrostatic actuator according to Claim 11, wherein the first and second electrode portions being provided on a stator.

14. The electrostatic actuator according to Claim 11, wherein the slider comprises a lens producing an image of an object, the lens being disposed on the slider,

orthogonal to the predetermined direction.

15. An electrostatic actuator comprising:

first and second electrode portions arranged at predetermined intervals, each electrode portion including a plurality of series of electrodes arranged successively in a predetermined direction;

a slider disposed between the first and second electrode portions and having electrode portions at side faces opposed to the first and second electrode portions and movable in the predetermined direction;

an electrostatic capacitance detecting circuit configured to detect an electrostatic capacitance between one series of electrodes of either the first electrode portion or the second electrode portion and the electrode portions of the slider; and

a driving circuit configured to drive the slider in the predetermined direction by applying voltages between selected series of electrodes of the first and second electrode portions and the electrode portions of the slider, said selected series of electrodes being selected based on a detected result of the electrostatic capacitance detecting circuit.

16. The electrostatic actuator according to Claim 15, wherein the first and second electrode portions are provided with both a function of driving the slider and a function of detecting the electrostatic capacitance.

17. The electrostatic actuator according to Claim 15, wherein the first and second electrode portions are provided on a stator.

18. The electrostatic actuator according to Claim 15, wherein the slider comprises a lens producing an image of an object, the lens being disposed on the slider,

orthogonal to the predetermined direction.

19. A camera module comprising:

photographing elements;

an electrostatic actuator connected to the photographing elements, the electrostatic actuator comprising,

first and second electrode portions arranged at predetermined intervals, each electrode portion including one or more series of electrodes arranged successively in a predetermined direction,

a slider disposed between the first and second electrode portions and having electrode portions at side faces opposed to the first and second electrode portions and movable in the predetermined direction,

an electrostatic capacitance detecting circuit configured to detect electrostatic capacitances between each one or more series of electrodes of one of the first electrode portion or the second electrode portion and the electrode portions of the slider, and

a driving circuit configured to drive the slider in the predetermined direction by applying voltages between selected series of electrodes of one of the first and second electrode portions and the electrode portions of the slider, said selected series of electrodes being selected based on a detected result of the electrostatic capacitance detecting circuit; and

a controller configured to control the driving circuit of the electrostatic actuator.

20. A camera module comprising:

photographing elements;

an electrostatic actuator connected to the photographing elements, said electrostatic actuator comprising,

first and second electrode portions arranged at predetermined intervals, the first electrode portion including three or more series of electrodes arranged successively in the predetermined direction and said second electrode portion including a single series of electrodes extended in a predetermined direction,

a slider disposed between the first and second electrode portions and having electrode portions at a side face opposed to the first electrode portion and movable in the predetermined direction,

an electrostatic capacitance detecting circuit configured to detect electrostatic capacitances between the three or more series of electrodes of the first electrode portion and the electrode portions of the slider, and

a driving circuit configured to drive the slider in the predetermined direction by applying voltages between selected series of electrodes of one of the first and second electrode portions and the electrode portions of the slider, said selected series of electrodes being selected based on a detected result of the electrostatic capacitance detecting circuit; and

a controller configured to control the driving circuit of the electrostatic actuator.

21. A camera module comprising:

photographing elements;

an electrostatic actuator connected to the photographic elements, said electrostatic actuator comprising,

first and second electrode portions arranged at predetermined intervals, each electrode portion including a plurality of series of electrodes arranged successively in a predetermined direction,

a slider disposed between the first and second electrode portions and having electrode portions at side faces opposed to the first and second electrode portions and movable in the predetermined direction,

an electrostatic capacitance detecting circuit configured to detect an electrostatic capacitance between one series of electrodes of either the first electrode portion or the second electrode portion and the electrode portions of the slider, and

a driving circuit configured to drive the slider in the predetermined direction by applying voltages between selected series of electrodes of the first and second electrode portions and the electrode portions of the slider, said selected series of electrodes being selected based on a detected result of the electrostatic capacitance detecting circuit; and

a controller configured to control the driving circuit of the electrostatic actuator.